**Abstract**

Zinc (Zn) is an essential micronutrient for plant growth and development, but toxic at high concentrations. The present study focused to underline the direct effect of different concentrations (0-50 ppm) of Zn on the regeneration ability and morphological characteristics of *Talinum portulacifolium* stem cuttings in hydroponic solution over a period of 35 days without the interference of other soil factors. High concentrations of Zn (40-50 ppm) affected callusing, root initiation, root and shoot development to varying levels. At high concentrations, Zn caused stem decay, stunting and browning of roots, wilting, withering and necrotic spots on leaves. Increasing concentrations of Zn inversely affected the lateral shoot development, stem elongation, leaf, root numbers and total root length of the stem cuttings. Though Zn had no significant influence on fresh or dry weights of stem, low concentration (15 ppm) of Zn increased the fresh and dry weights of leaves by 11.17% and 26.79% respectively, compared to 0 ppm and with 77.06-243.80% and 47.92-255.00% compared with those raised in 20-50 ppm. Zn concentrations >10 ppm reduced the root fresh weight by 28.57-90.47% and dry weight by 27.27-90.91% than those at 0 ppm. The Zn content in leaves and stems increased linearly with increasing concentrations of Zn and ranged from 1.09-125.62 ppm and 1.00-110.26 in stems and leaves respectively. The tolerance index varied between 81 and 138 for different concentrations of Zn. The results of the study clearly indicate that high concentrations of Zn inhibit the regeneration of *T. portulacifolium* stem cuttings.